

## NORTH PACIFIC OCEAN

By WILLIS E. HURD

During October, 1930, the condition of the atmospheric pressure over most of the upper half of the North Pacific Ocean underwent considerable average change. For several months the anticyclone common to middle latitudes had extended much farther north than usual, even overrunning the Aleutian region and the lower waters of the Bering Sea. In September the Aleutian low succeeded in organizing and in penetrating the upper part of the Gulf of Alaska, and in October it spread from the central Gulf westward, well across the island chain and adjacent waters, toward the Asiatic coast. In average pressure, however, it was still above the normal for the month, although the mean readings at Kodiak, Dutch Harbor, and St. Paul were below 29.80 inches. The North Pacific anticyclone retreated mostly into middle latitudes in October, except that its eastern extremity lay off the American coast between northern California and middle British Columbia. The departures from average barometric pressure were below normal only over southern California and the lower waters of the Pacific, as shown by the stations at San Diego, Honolulu, and Midway Island.

The following table gives barometric data for several island and coast stations in west longitudes, including Point Barrow on the Arctic Ocean.

TABLE 1.—Averages, departures, and extremes of barometric pressure at sea level at indicated hours, North Pacific Ocean and adjacent waters, October, 1930.

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	Inch	Inches		Inches	
Point Barrow <sup>1 2</sup>	30.11		30.60	14th	29.60	19th.
Dutch Harbor <sup>1</sup>	29.77	+0.08	30.22	12th	29.00	24th.
St. Paul <sup>1 2</sup>	29.74	+0.08	30.26	12th	29.02	24th.
Kodiak <sup>1 2</sup>	29.73	+0.14	30.36	13th	28.96	25th.
Midway Island <sup>1</sup>	30.03	-0.02	30.24	27th <sup>3</sup>	29.76	2d.
Honolulu <sup>1</sup>	29.97	-0.03	30.13	23d	29.73	4th.
Juneau <sup>1</sup>	29.87	+0.01	30.41	15th	29.19	23d.
Tatoosh Island <sup>1 2</sup>	30.03	0.00	30.47	27th	29.45	7th.
San Francisco <sup>1 2</sup>	29.97	+0.03	30.24	30th	29.68	7th.
San Diego <sup>1 2</sup>	29.90	-0.03	30.08	31st	29.69	6th.

<sup>1</sup> P. m. observations only.

<sup>2</sup> For 30 days.

<sup>3</sup> And on the 28th.

<sup>4</sup> A. m. and p. m. observations.

<sup>5</sup> Corrected to 24-hour mean.

While there was an increase in the number of days with gales in October, as compared with September, yet over the main body of the ocean the degree of storminess was somewhat less intense, except in coastal localities, than in the preceding month. In Japanese waters, however, especially along the south and east coasts, and as far to the eastward of Honshu as longitude 155° E., storms of great severity occurred from the 26th to the 31st of the month. During this period storm to hurricane velocities were reported by several vessels, and on the 27th a barometer reading as low as 28.75 inches was noted on board the Japanese steamship *Kinai Maru*, near 40° N., 150 E. The first of the two cyclones occasioning these heavy conditions originated in the Eastern Sea about the 24th, and by the 26th was causing gales of force 12 at some distance east of Yokohama. On the 27th the major gale area, with wind forces up to 11, lay southeast of the island of Yezo, and on the 28th, with diminished energy, lay southeast of the Kuril Islands. The second cyclone appeared as a slight depression over eastern China on the 29th. It followed nearly the course of its predecessor,

except that it came into closer proximity to the Japanese coast, strongly influencing the southeastern islands of the archipelago on the 30th, and causing hurricane winds south and east of Honshu on the 31st, with barometer down nearly to 29 inches. The American steamship *Golden Tide* reported that the seas on this date were so heavy that her roll amounted to 50°.

Of the purely extratropical gales not exceeding 10 in force, as reported, one occurred on the 22d, near 35° N., 145° W., on the lower edge of a Gulf of Alaska depression, and another was experienced near 46° N., 173° E., on the 29th. Gales of force 8 and 9 were fairly well distributed as to date over the ocean, but were about two times more frequent along the middle and upper routes over the western than over the eastern half of the ocean. The deepest extratropical cyclone of the month in upper waters appeared over the Bering Sea and reached its greatest intensity on the 24th and 25th, Kodiak having a barometer reading of 28.96 inches on the latter date. The storm moved slowly eastward into the Gulf of Alaska, where it remained as a fluctuating disturbance of reduced intensity until the end of the month. Few gales, however, as far as known, and those not exceeding 9 in force, accompanied its prevalence.

In the Asiatic Tropics a typhoon of some severity caused fresh to whole gales on the 1st and 2d south of the Ogasawara Islands.

From the 8th to the 12th strong northeast monsoon winds prevailed in the Balintang Channel and off the China coast, frequently attaining gale force. During a part of the time the monsoon was strengthened by the presence of a low east of Luzon, which added to the gradient between its center and the powerful anticyclone then existing over southeastern Asia.

In the American Tropics the weather was frequently disturbed, cyclones, northers, and squalls of various types contributing to the unrest. At least three cyclones occurred, of which two are known to have acquired hurricane wind forces.

First and most intense of the cyclonic storms was that which apparently originated near the Revillagigedo Islands or slightly to the southward about the 3d. Moving northeastward into the entrance to the Gulf of California, where it became extraordinarily severe and slow of progression on the 4th and 5th, it entered the Mexican coast north of Mazatlan. Overland it diminished in energy to little more than a mere depression, but acquired greatly accelerated speed, and died out in Arkansas on the 7th. The storm was reported as one of the fiercest on record in the Gulf of California, and several steamships were dangerously involved in its hurricane winds. Among those sustaining considerable damage were the American steamships *Ecuador*, *Santa Isabel*, and *Wind Rush*, the British steamships *Paris City* and *Viking Star*, and the British motorship *Japanese Prince*. The cost of the repairs to the *Ecuador* was estimated at \$10,000. The *Japanese Prince*, in addition to structural losses sustained by the vessel, had a damaged cargo resulting from shifting in the unusually precipitous seas. The *Viking Star* specifically referred to the "terrific list" of the vessel, which put the engine out of action owing to inability to fire.

The *Viking Star* also reported a barometric reading of 27.72 inches at 12:45 p. m. of the 4th, while in the calm center of the storm, in 21° 41' N., 108° 27' W. This reading is the lowest of record for any hurricane occurring in Mexican west coast waters. The *Wind Rush* reported that from 9 to 10 a. m. of the 4th, in 21° 23' N., 018° 41' W., "we were in a calm spot with no wind and smooth

sea, and with the sun shining, lowest barometer 28.17 inches." This is the second instance of the clear eye of the storm being observed in a cyclone in these waters, the earlier instance being reported by the American destroyer *Noa*, at practically the same spot, during the hurricane of June 10, 1930. It also gives one of the few instances on record of smooth seas in the central calm. After leaving the eye, the *Wind Rush* had generally rising barometer for nearly 24 hours, accompanied by storm winds, but from 9 a. m. to 12:30 p. m. of the 5th, during which time the vessel drifted with engine stopped, the barometer again fell a half inch, with renewal of hurricane velocities, in 22° 40' N., 107° 26' W. This indicated, in connection with her southeasterly winds at this time, that the hurricane had progressed but little since noon of the preceding day, and that in drifting she had kept just ahead of the storm center for hours. The *Viking Star* had a similar experience with reference to the seemingly abnormal change of the winds.

While this cyclone was gathering on the 3d, it is evident from the reports of several other vessels farther south on the same date that the weather was also disturbed between Salina Cruz and Acapulco, moderate to fresh gales being encountered off the coast, with lowest barometer read at 29.65 inches.

The second hurricane was that of the 9th to 11th west of the Gulf of Tehuantepec and up the coast to about as far as Acapulco. The American steamships *Buffalo Bridge* and *Saramacca*, and the British motorship *King Edwin* encountered hurricane velocities variously in this storm from north, northeast, east, southeast, and south.

The lowest barometer was 29 inches, read on board the *Saramacca* at 10.15 p. m. of the 10th, in 16° 06' N., 99° 16' W.

The third cyclone was that of the 16th to 18th between Acapulco and Cape Corrientes. The storm caused strong to whole gales along a considerable stretch of the coast, and after leaving the vicinity of the cape, advanced inland and died out on the 20th in the Bay of Campeche. The lowest recorded barometer was 29.31 inches, reported by the American steamship *American*, in 17° 52' N., 103° 38' W., on the 17th.

Severe squalls occurred on the 4th in Panama Bay, and on the 6th off the coast of Costa Rica. Northers of moderate to fresh gale force occurred over or near the Gulf of Tehuantepec on the 2d, and of whole gale force on the 31st, this strong norther beginning on the 30th and continuing until about the 4th of November. Moderate southerly gales, accompanied by a slight barometric drop, blew near 8° N., 105° to 111° W., on the 9th and 10th.

At Honolulu the prevailing wind was from the east, with a maximum velocity of 24 miles an hour from the east on the 23d.

Fog lessened materially since September over most of the northern routes in both east and west longitudes. It occurred on about five days south of the central Aleutians, and on 10 to 12 days at scattered points south of the Gulf of Alaska. Off the American coast, however, fog showed an increase in frequency over that of September, being reported, at the maximum, on about 12 days off central California, and on about 10 days off the coast of Washington.